A Decade of Concern: A Review of Multicultural Science Education Issues in *The Science Teacher*

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Multicultural science education has long been of interest to the National Science Teachers Association (NSTA). In 1991, NSTA adopted a position statement on multicultural science education, which was revised in 2000. In 1993, Mary M. Atwater's article in The Science Teacher clearly presented three premises for multicultural science education: 1) All children can learn science, 2) Every student is worthwhile to have in the science classroom, and 3) Cultural diversity is appreciated in science classrooms because it enhances rather than detracts from the richness and effectiveness of science teaching (Atwater 1993). For the past decade, The Science Teacher has devoted one issue each publishing year to multicultural science education.

This article examines the issue of multicultural science education as reflected in the published articles of *The Science Teacher* over the past decade. The goal of this review is to help teachers—especially new or preservice teachers and those who implement multicultural science education because of district mandates or changing classroom demographics—understand the importance of multicultural science education and to provide teachers with a list of resources they can refer to for additional information and activity ideas.

Defining multicultural education

Before beginning a review of the literature, it is necessary to define the term *multicultural education.* Geneva Gay defines it as ". . . the policies, programs, and practices employed in schools to celebrate cultural diversity. It builds on the assumption that teaching and learning are invariably cultural processes. Since schools are composed of students and teachers from a wide variety of cultural backgrounds, the best way for the educational process to be most effective for the greatest number of students is for it to be multicultural" (1994, p. 3).

The goal of multicultural education is to include all students regardless of background. Nieto (1996) defined multicultural education in a sociopolitical context. The author stated, "multicultural education is a process of comprehensive school reform and basic education for all students. It challenges and rejects racism and other Forms of discrimination in schools and society and accepts and affirms the pluralism (ethnic, racial, linguistic, religious, socioeconomic, gender, and ability among others) that students, their communities, and teachers represent. Multicultural education permeates the curriculum and instructional strategies used in schools, as well as the interactions among teachers, students, and parents, and the very way that schools conceptualize the nature of teaching and learning" (Nieto 1996, p. 307).

In essence, to acknowledge and practice multicultural education requires that teachers become more inclusive about how students think and learn academic content. Pedagogical practices and social relations with students should not only acknowledge content competence, but should also reflect the strengths of who students are and where they come from.

Framework of multicultural education

Broadly conccived, multicultural education has different, pertinent dimensions (Banks 1995). According to Banks (2001), the dimensions of multicultural education include: content integration, knowledge construction, prejudice reduction, equity pedagogy, and an empowering school culture. To integrate content, teachers employ examples and content from a multitude of cultures in their teaching. For students to construct knowledge,

teachers assist students in understanding, investigating, and determining how "implicit cultural assumptions, frames of references, perspectives, and biases within a discipline influence the ways in which knowledge is constructed within it" (Banks 2001, p. 20).

To reduce prejudice, teachers should use lessons and various activities to help their students develop positive, healthy attitudes toward different cultural groups. if schools are to support an empowering culture, then the schools as an organizational entity should promote gender, racial, and social-class equity. Practices such as reform, restructuring, grouping and labeling, sports participation, disproportionality in achievement, and faculty/staff interactions should be constantly examined for the purposes of providing an equitable, empowering environment for students, teachers, and administrators.

While Banks (2001) presents dimensions for inclusion of multicultural education in the school environment, Baptiste and Key (1996) assess multicultural education in science classrooms though use of a cultural typology. This typology includes three levels. In Level 1-Product, teachers isolate their focus on the

FIGURE 1

The six tenets of the NSTA Position Statement on Multicultural Science Education.

1. Schools are to provide science education programs that nurture all children academically, physically, and in development of a positive self-concept;
2. Children from all cultures are to have equitable access to quality science education experiences that enhance success and provide the knowledge and opportunities required for them to become successful participants in our democratic society;
3. Curricular content must incorporate the contributions of many cultures to our knowledge of science;
4. Science teachers are knowledgeable about and use culturally related ways of learning and instructional practices;
5. Science teachers have the responsibility to involve culturally diverse children in science, technology and engineering career opportunities; and
6. Instructional strategies selected for use with all children must recognize and respect differences students bring based on their cultures.

FULL TEXT OF THE POSITION STATEMENT IS AVAILABLE ONLINE AT *WWW.NSTA.ORG/POSITIONSTATEMENT&PSID=21*

FIGURE 2

A sampling of multicultural science education articles in *The Science Teacher*, 1995–2005 in chronological order.

(Note: Refer to Figure 1 for a list of the Position Statement tenet(s) addressed. For a list of all 69 articles, visit the online version of this article at *www.nsta.org/highschool#journal*)

Title of *The Science Teacher* article	Article summary	Particulars for science teachers	Position statement tenet(s) addressed	Student Group(s) addressed
Atwater, M.M. "The multicultural science classroom." (February 1995, pp. 20–23).	Teachers cannot continue to believe that other children have intellectual deficits and cannot learn or do science.	General	1, 2, 5	All learners
Allen-Sommerville, L. "Capitalizing on diversity." (February 1996, pp. 20–23).	Teachers should adapt their lessons to diverse learning styles. A program presents strategies for teaching science to ethnic minority groups.	General	6	All learners
Hill, S. "Encouraging equitable enrollment." (February 1997, pp. 18–21).	One school district serves as an example of how problem-based learning and systemic change can increase minority participation in math and science.	Environmental Science, Biology, Chemistry	1, 5, 6	African Americans
Keating, J.F. "Harvesting cultural knowledge." (February 1997, pp. 22–25).	A teacher describes how ethnobotany can bridge modern science and tradition in a Native American school.	Biology Chemistry	2, 3, 4, 6	Native Americans (Navajo)
Madrazo, G.M. "Embracing diversity." (March 1998, pp. 20–23).	To share science with students from diverse backgrounds, teachers must integrate multicultural curricula into their lessons.	General	1 – 6	All diverse learners
Nix, M. "Stellar women." (March 1998, pp. 28–31).	This article highlights women's work in astronomical research.	Physics (Astronomy)	3	Females
Thomson, B.S. et al. "Creating a culture for success." (March 1999, pp. 23–27).	Individualized instruction is especially beneficial when providing remediation to at-risk and minority students.	General	4	African Americans
Moreno, N. et al. "Parents count." (March 1999, pp. 28–31).	Parent and community support can be important to science education.	Interdisciplinary sciences	1, 2	African Americans and Hispanics
Chillot, L.A. "The science of special education." (March 2000, p. 10).	Teachers can help students acquire academic scientific language and thus make science more accessible and equitable.	General	2	Special needs
Stokes, N.C. "The fine art of science." (March 2001, pp. 22–24).	Gyotaku, Japanese fish printing, employs skills in critical thinking and scientific inquiry.	Biology	3, 6	All learners
Moore, R. "Our apartheid: the imperative of multiculturalism in science education." (March 2002, p. 10).	The author pleads with educators to make courses, curricula, and classrooms more friendly and accessible to ethnic minority, special needs, and low-income students.	General	1, 2	Ethnic minorities, special needs, low income
Sanfeliz, M., and M. Stalzer. "Science motivation in the multicultural classroom." (March 2003, pp. 64–66).	Students construct science knowledge through active participation.	General	2	Ethnically diverse
Hanes, C. "Chemistry as a second language." (February 2004, pp. 42–45).	Making the chemistry curriculum accessible to English-language learners by incorporating multiple intelligences, learning cycle, and specially designed academic instruction in English strategies.	Chemistry	2, 4, 6	English-language learners

contributions of scientists of color and women scientists. This focus, for example, would probably occur during months that honor African Americans or Women's History. [In] Level II-Process/product, inclusion of diverse cultural perspectives and contributions arc made in the classroom on a more regular basis. For instance, teachers teach to diverse learning styles and cognitive styles. Problem-solving activities and scientific methodologies arc also used to dispel ethnic and gender stereotypes and reduce prejudice. In Level III-Process/philosophical orientation, teachers commit to social activism. These teachers "actively design, develop, or seek out science programs that are truly antiracist and multicultural" (Baptiste and Key 1996, p. 34).

Reviewing the articles

For our review of the articles in the multicultural science education issues of *The Science Teacher* we decided to compare the articles with the 2000 NSTA Position Statement on Multicultural Science Education (the six tenets of the position statement are listed in Figure 1, p. 50).

We chose to use the structure of the statements with respect to the tenets to determine which tenets the articles addressed. We were also curious to uncover trends and issues based on articles grouped in particular years fix-publication.

Our analysis revealed that most of the articles were based on instructional strategies. others were program descriptions designed to highlight efforts to strengthen underrepresented minorities, presence in science classes and to heighten their motivation to pursue science and science-related careers. Still other articles, particularly invited papers, commentaries, and Editor’s Corner features, reminded science teachers of the continued practice of cultural inclusiveness based on the NSTA Multicultural Position Statement.

Several articles offered efforts targeted at particular cultural groups, such as African American students (12 articles) and Native American populations (6). Additional articles responded to the expressed need for teachers to know how to effectively teach English as a second language (8), special-needs students (.3), and females in science classes (9). While most of the articles addressed general science needs (34), several articles offered particular science content area applications (14 in physics/ physical science, 1 I in biology, 7 in chemistry, 2 in Earth science, and I in computer science).

In total, we reviewed 69 articles. A sampling of our findings is found in Figure 2 (p. 51). For a list of all 69 articles, visit the online version of this article at *www.nsta.org/highschooNjournal.*

What's next?

So where do we go in the next decade? In an era of accountability, how can we still maintain the tenets of the 2000 NSTA Multicultural Position Statement and make sure that we "make adequate yearly progress"? In our extensive involvement in local public schools, we rarely see the engagements of students as referred to in the numerous articles that were presented; however, we believe that such engagement occurs—just not often enough and not always with students who stand the most to gain from such engagements.

Science teachers must become acquainted with their students, especially within the communities in which they have. By doing so, science becomes a contextualized engagement and a culturally relevant experience, one that allows students to link their daily experiences to what they do in class. To accomplish this feat will require that teachers move from the comfort of their classrooms to the communities of their students to find those connections and relationships. Teachers must educate themselves through personal investigations and professional development in the historical contributions of different ethnic groups to the development of science. In doing this, teachers, knowledge bases will expand and students will have opportunities to recognize that people who look like them, speak like them, overcome obstacles like them, and persevere like them can he successful and make contributions to our society. The diversity that exists in our classrooms makes learning richer and more interesting for teachers and students alike. Delivery of instructional content through strategies that honor who students are as an ethnic group, as diverse learners, and as members of a democratic society will certainly make a difference and enhance the teaching of science to all learners.

References

Atwater, M.M. 1993. Multicultural science education. The *Science Teacher* 60(3): 32-37.
Banks, J.A. 1995. Multicultural education: Historical development, dimensions, and practice. I *n Handbook of research on multicultural education,* cols. J.A. Panics and C.A.M. Banks, 3-24. New York: Macmillan.
Banks, J.A. 2001. Multicultural education: Characteristics and goals. In *Multicultural Education: Issues, & Perspectives* V' cd., cis. J.A.Banks and C.A.M. Banks, 3-30. New York: John Wiley & Sons.
Baptiste, H.P., and S.G. Key. 1996. Cultural inclusion. The *Science Teacher* 6.3(2):.32-35.
Gay, G. 1994. /1t *the essence of learning: Multicultural education.* West Lafayette, IN: Kappa Delta Pi.
Nitro, S. 1996. *Affirming diversity: The sociopolitical context of multicultural education.* New York: Longman.
on the web To view NSTA's position statement on Multicultural Science Education, visit eueueu.nsta.ag/positionstatemevzt&psid=21. Hull versions or *The Science Teacher* articles from 1996 to the present are available to NSTA members at unout.nsta.org/highschool#journal by clicking on "Journal Archives."